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AUTHOR Hunt, David E.; And Others
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ABSTRACT

This paper considers criteria which affect the likelihood of a psychological idea being adopted in educational practice. Likelihood of implementation is considered in terms of how the psychological idea is evaluated on these criteria; objective validity, potential relevance, comprehensibility, feasibility, and how effectively it is translated to an educational perspective. The analytic system is illustrated by application to the implementation of the conceptual level, matching model (which states that the higher the student conceptual level, the less structure required in his educational environment) to the organization and allocation of resources in an open elementary school. An 11-item bibliography is included. (Author/MJM)

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From psychological theory to educational practice: implementation of a matching model[1]

David E. Hunt, JoAnn Greenwood, Ronald Brill
Ontario Institute for Studies in Education
Michael Deineka
North York Board of Education

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If psychological ideas are to be implemented into educational practice, more attention is required to how ideas are translated into practice, and why some ideas are implemented and others not. While one may agree with Kurt Lewin that "There is nothing so practical as a good theory", psychological theories have not always been applied to educational problems with maximum effectiveness. Therefore, the purpose of this paper is to consider criteria which affect the likelihood of a psychological idea being adopted in educational practice. The application of a psychological idea to educational practice is illustrated by the use of the Conceptual Level matching model (Hunt, 1971) as the basis for the homogeneous classroom grouping of students in an elementary school and in a junior high school.

Four criteria to describe the likelihood of an idea being successfully implemented are proposed in relation to this illustration. Before describing the model and its application it should be noted in seeking criteria for successful implementation that they will not be the same as the evaluation of an idea for scientific purposes. This is not to say that the objective validity of an idea is not important proof, but it is not the only criterion. Despite psychologists' reliance upon tests of statistical significance applied

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to results collected in controlled experiments as the only means of evaluating ideas, there are other criteria which determine the successful implementation of an idea. Psychologists' failure to consider other criteria has accounted for much of the lack of success in implementing their ideas into educational practice.

The following quotation (Hunt, 1970) elaborates this idea:

> "Of course, the prime consideration is whether the principle is sufficiently well established to attempt implementation, and such validity should not be ignored. However, at the risk of seeming cynical, it seems unlikely that the validity of an educationally relevant psychological principle will have very much to do with whether or not it is accepted in educational practice. Validity of a principle is probably a necessary, but certainly not a sufficient, condition to insure its adoption.
>
> Assuming that the matching principle is sufficiently well established, it seems probable that one of the major determinants of its acceptability will be the degree to which it is congruent with the 'implicit matching principles' that teachers have in their heads. If one accepts

> this formulation, then the task of implementing a matching model should begin with an investigation of what 'theory of matching' the educational decision-maker is now using, because from what we know of attitude change and adoption of new procedures, the suggested matching prescriptions should not be too far out of line with those held by the person who will be implementing the prescription." (p. 49.)

Therefore, an idea should be evaluated in terms of how it fits in with what a teacher thinks, as will be illustrated later.

Conceptual Level Matching Model

The Conceptual Level matching model (Hunt, 1971) is derived from a theory of personality development (Harvey, Hunt, and Schroder, 1961). To be helpful to teachers, a developmental theory should specify the educational needs of students at different stages of development and should distinguish between a child's immediate needs (contemporaneous) and his long-term requirements for growth (developmental). The Conceptual Level (CL) model exemplifies an approach which attempts to specify those environments most appropriate for a child at a given stage both for contemporaneous and developmental purposes.

The CL matching model therefore illustrates how a theory of personality development provides both a <u>developmental</u> perspective and a <u>contemporaneous</u> perspective. For example, a student might be at a dependent, conforming

stage of development (or contemporaneous orientation). In dealing with such a student, a teacher may take account of his contemporaneous orientation to plan the immediate educational environment likely to be most effective. The teacher may also bear in mind that efforts should be directed in the long run to the developmental goal of increasing the student's independence.

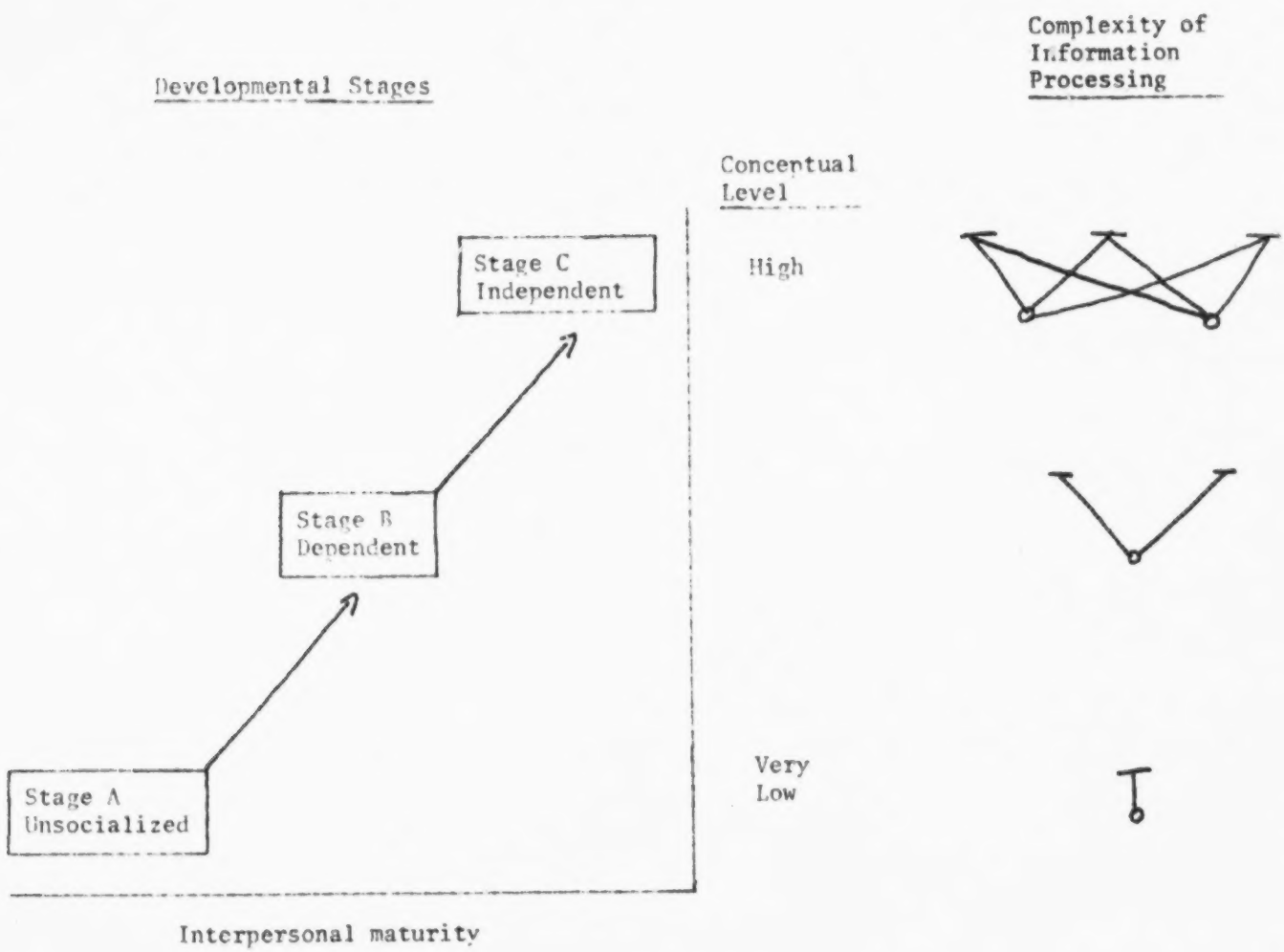
Conceptual development is viewed on a dimension of conceptual complexity or interpersonal maturity. Although development is (under ideal conditions) continuous, this process can best be described in stages or segments, much as a motion picture sequence could be represented by selecting still shots from the sequence. The diagram in Figure 1 (from Hunt and Sullivan, in press) shows three stages -- A, B, and C -- which are different designations than the Sub I, Stage I, and Stage II used earlier (Hunt, 1971), but the letters are presently more appropriate.

The sequence of stages can be telegraphically summarized as proceeding from an immature, unsocialized stage (A) to a dependent, conforming stage (B) to an independent, self-reliant stage (C). The diagram on the left side of Figure 1 is intended to represent this development. From a developmental view, the stages can be described in terms of increasing interpersonal maturity and increasing understanding of oneself and others.

Progression from Stage A to Stage B requires the conceptual work of defining the external boundaries and learning the generalized

Figure 1

Variations in Conceptual Level



cultural standards which apply to both self and others. This learning of rules and roles is the basic assimilation of cultural norms and expectations.

This general standard incorporated in Stage B serves as the anchoring basis for the self-defining work in progressing to Stage C. Self-definition occurs through a process of breaking away from the standard developed in Stage B. Learning about how one is distinctively oneself provides the basis for beginning to accept individual responsibility for outcomes. Stage C independence may appear initially in exaggerated form, but is nonetheless the person's first awareness of his own feelings as cues for differential action.

As Figure 1 indicates, progressive conceptual development refers both to increasing interpersonal maturity (on the horizonal axis) and increasing conceptual complexity, or effectiveness in processing information (on the vertical axis). Thus, the Stage C person is not only more independent than the Stage B person, but also superior in processing information.

Matching prescriptions

The Conceptual Level developmental model is an interactive theory of development which considers developmental progression or growth to be determined both by the person's present development stage and by the environment he experiences.

The matched environments for development, that is, the one most likely to produce stage-specific development in Figure 1 were derived by simply asking the question, "Given the conceptual work required to

progress from one stage to the next, what is the environment most likely to facilitate such work?" For example, the Stage A person, in order to progress to Stage B, must understand and incorporate the cultural rules. Since rules are learned best when the rules are clear, the ideal environment to foster development to Stage B is therefore a clear, consistent, highly structured one.

Following similar logic, the ideal environment for progression to Stage C is moderately structured, but encourages self-expression and autonomy. These environments are summarized in the left side of Figure 2.

The right-hand side of Figure 2 indicates the matched contemporaneous environments. The basic dimension of environmental variation is degree of structure. In high structure, the environment is largely determined by the training agent (parent, teacher), while the person himself (child, student) has little responsibility for what happens in the environment. In low structure, by contrast, the person experiencing the environment is at least as important in determining the environment as the training agent. Given the characteristics of low CL persons (categorical, dependent on external standards and incapable of generating their own concepts), one predicts thay they will profit more from highly structured approaches. Given the characteristics of high CL learners (capable of generating new concepts, having internal standards to a higher degree, and being capable of taking on different views), it is predicted that they will either profit more from low structured approaches or be unaffected by the degree of structure. Thus, the heart

Figure 2

Conceptual Level matching models

Developmental

Developmental Stage	Matched environment for development
Stage C Independent	Unstructured with emphasis on autonomy
Stage B Dependent	Encourage self-expression within moderate structure
Stage A Unsocialized	Accepting but firm; highly structured

Contemporaneous

Conceptual Level	Complexity of Information Processing	Matched Environment
High		Low Structure
Low		High Structure
Very Low		Very high Structure

of the CL matching model is a generally inverse relation between CL and degree of structure: "Low CL learners profiting more from high structure and high CL learners profiting more from low structure, or in some cases, being less affected by variation in structure." (Hunt, 1971, p. 44.)

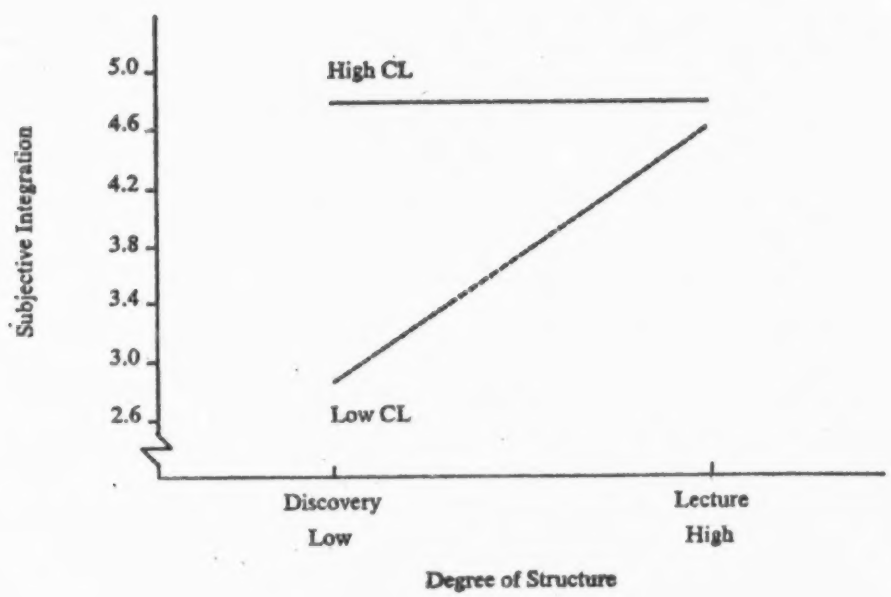
Construct validity

McLachlan and Hunt investigated the interactive effects of learner CL and variations in structure. These variations were represented by a discovery (low structure) vs. lecture (high structure) approach. Equal numbers of low and high CL students, matched on ability, were assigned to each of the two instructional methods. The content of the presentation consisted of a specifically designed set of visual materials aimed at acquainting the student with the Picasso painting, "Guernica". Students in both conditions were shown the same pictorial materials -- a slide containing the entire picture and a series of component parts of the picture on separate slides. Students in the lecture method heard a short explanation of the meaning of each component slide, while students in the discovery method viewed each slide for a comparable length of time, but were instructed to work out for themselves what the picture meant. Afterward, students were asked to give their own idea of the central meaning of the picture, and how the parts fitted together into this meaning (subjective integration). Figure 3 indicates the pattern of results for subjective integration.

Results indicated that the low CL students performed significantly better ($p < .05$) with high structure (lecture) than with low structure (discovery).

Figure 3

Subjective integration as a function of Discovery vs. Lecture and Learner CL



In a companion study, Tomlinson and Hunt (1971) used the matching model to investigate the differential effects of rule-example order as a function of learner CL. Groups of low and high CL students were assigned equally to three treatment conditions varying in degree of structure. Low structure consisted of instruction by first presenting the examples, with the rules presented at a much later time. Intermediate structure consisted of instruction in which the examples were presented first followed almost immediately by the rule. In the high structure method, the rule was presented before the examples. The rule, or principle, was Festinger's concept of "cognitive dissonance," and the examples were included in a brief excerpt from a story about two college boys. Students' concept learning was indexed by multiple criteria: definition of concept, recall of examples, and production of new examples. Figure 4 presents the composite scores recorded one week after instruction.

Analysis of the results in Figure 4 indicated a highly significant CL x treatment effect (IQ effects having been removed by regression), and the expected pattern was borne out when comparing the mean scores. Under conditions of low and intermediate structure, the low CL groups were significantly lower ($p < .05$) than the high CL groups. The low CL groups under low and intermediate structure were also significantly lower ($p < .05$) than the low CL group under high structure. Although there was a tendency toward disordinal interaction, the difference between CL groups in the high structure condition was not significant. Other construct validity evidence is summarized in Hunt, 1971, Chapters 2 and 3.

Figure 4

Concept Learning as a Function of Rule-example Order and Learner CL

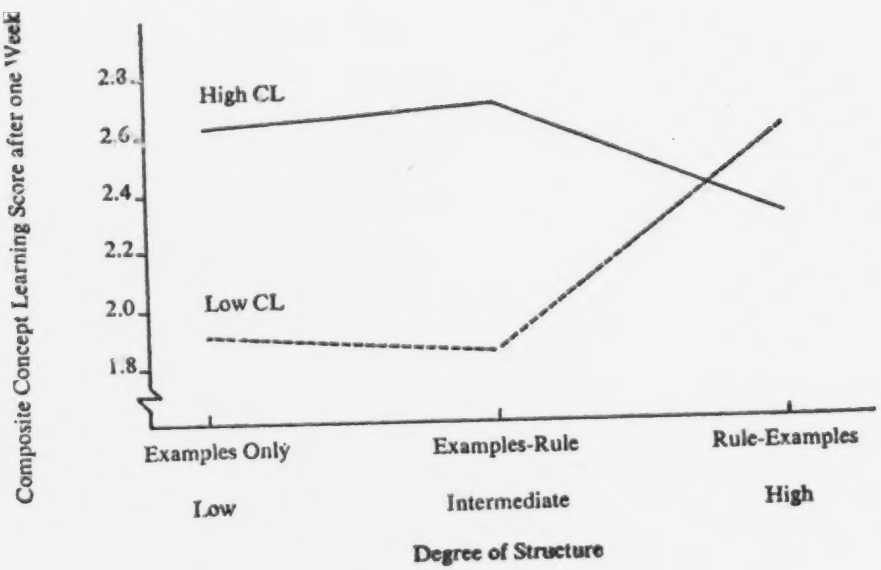


Figure 5 provides a summary of stage characteristics with the corresponding matched instructional environment. In educational practice, low structure is exemplified by student-centered approaches, discover learning, and presenting examples before giving the principle. In all these cases, the student is primarily responsible for organizing the material. High structure is exemplified by teacher-centered approaches, learning through lecture, and presenting the rule or principle before the example. In these methods, responsibility lies primarily with the teacher.

Conceptual Level scoring and classification

To index CL, we have used a method that requires the person to do some conceptual work. He must react to a stimulus likely to require some "cognitive work" in his response. Specifically, the Paragraph Completion Test (PCT) consists of six topics listed in Figure 6. To each of these the person responds with three or four sentences, indicating his own personal reaction to the topic. Each of the responses is coded according to a scoring manual. As Figure 6 indicates, each response receives a score from 0 to 3 on the basis of the generic stage referents, i.e., Stage A referents scored 0; Stage B referents scored 1; transitional B/C referents scored 2; and Stage C referents scored 3. A person's CL score is then obtained by averaging the highest of his three scores. With trained raters, the inter-rater reliability is .80 to .85.

Psychological theories are not theories of implementation

There is an important difference between a psychological principle and how to implement that principle. To understand a child's needs, for example, neither assures that they will be met nor does it indicate

Figure 5

Characteristics of stages and matched instructional environments

Stage (CL)	Stage characteristics	Matched instructional environment (with examples)
Stage C (High CL)	Self-responsible, Multiple alternatives Capacity for integration	Low structure: Discovery approach Example-rule Student-centered
Stage B (Low CL)	Authority-oriented Concerned with rules Categorical thought	High structure: Lecture Rule-example Teacher-centered
Stage A (Very low CL)	Self-protective Immature self-centeredness No alternatives	

Figure 6

Conceptual Level scoring and classification

Paragraph Completion Test (PCT) items:

1. What I think about rules...
2. When I am criticized...
3. What I think about parents...
4. When someone disagrees with me...
5. When I am not sure...
6. When I am told what to do...

PCT item score	Example of scoring referent	Stage
3	Multiple alternatives	C
2	Beginning self-definition	
1	Categorical thinking	B
0	Self-protection	A

specifically how they should be met. The matching principle just described, for example, specifies a matched environment for one particular student, but not how to provide that match. We describe implementation through homogeneous classroom grouping, but there is nothing in the theory which says that the unit of implementation should be a classroom. It could be implemented within a classroom or in an entire school (Hunt, 1972). This is not to minimize the important differences between plans which implement within classrooms, between classrooms, or between schools, but a theory of personality development does not address this issue directly since it is not a theory of implementation.

How the teachers posed the problem

The matching model was applied in two schools, one elementary and one junior high, to classify students into groups so that the teachers could work with them more effectively and efficiently. Before describing the specific application, it will be helpful to consider how each group of teachers saw the problem.

Elementary school team

The first example concerns a teaching team of five teachers who were working together last Spring in a new open-concept elementary school. The five teachers were assigned to work with approximately 165 grade 5 and grade 6 students in whatever ways would be most effective for the students. As in most open schools, physical facilities were quite flexible so that the teachers could arrange their interactions with the students in a variety of forms. As these teachers became better acquainted with each other and with their students, they began to discuss ways in which they might arrange the learning situations more effectively. In their

discussions, the teachers all agreed that the students varied considerably in terms of what way of teaching was best for them, some thriving when allowed to work by themselves while others needed much more teacher structure and support. They described the students initially as varying in independence or in how much structure they required. The teachers were therefore concerned with student differences which could be translated into different procedures. They were not concerned with categorizing the students for its own sake,but only with how such categories could be transformed into decision about more effective educational practice.

Junior high school team

This teaching team was comprised of four teachers, one each in English, Mathematics, Science, and Social Science, and last Spring they were responsible for approximately 150 Grade 8 students in these four subjects. They were free to organize the students in whatever way they wished for this instruction, and they were relatively dissatisfied with the organizational arrangements they had attempted. In their team discussions, they had also observed that the students differed widely in their requirements for structure. They were concerned with educational arrangements which would facilitate their coordination as a team working with each student in a way which would encourage him to become more self-confident and independent. They were particularly aware that in the compartmentalized organization of a junior high school, teachers are less likely to have the time to get to know each student as an individual.

Liaison between psychologists and teachers

One of the authors is a member of the Professional Development staff in this school district, and fortunately he was both aware of the matching ideas at OISE and was working with each of these two teams. In each case, he brought the matching ideas to the attention of the teaching team, and the team requested an opportunity to meet with members of our project staff. That the request for liaison and establishing the relation came from the teacher team can hardly be overemphasized. It is possible for psychologists to develop a good working relation with teachers who have not initiated the idea, but considerable time is required for teachers to consider whether or not they wish to become involved.

The initial meeting in both cases involved the teaching team, school principal, professional development member, and the OISE project staff. In each case, the first meeting consisted of working toward some common understanding through a process roughly summarized in Figure 7. There were, of course, differences in these meetings, but there were many similarities. The teachers were concerned with the goals of providing a positive enjoyable educational experience for their students, of helping them to think and solve problems, and encouraging each student to become more self-sufficient and independent. They were also very sensitive to describing students in ways which might be stigmatizing. Thus, they felt that descriptive terms such as "needing more structure" and "needing less structure" were preferable to describing students as dependent and independent.

Figure 7

Translating psychological terms into educational practice

Psychological idea or term	Educational translation
Matching	Meeting a student's needs
Conceptual Level	Learning style
Low CL	Student who needs structure
High CL	Student who needs less structure
Variation in structure	Teaching methods
Paragraph Completion Test	Questionnaire
Developmental perspective	Providing support for growth
CL grouping	A way to help students become more independent and increase their self-esteem

After sharing views with us about terms, goals, and procedures, the teachers and their principal were interested in the validity of the model and the specific features of how it might be applied, e.g., how students were assessed. After these meetings, each teaching team requested that we classify their students into learning style groups for the following year which required assessing students then in Grade 4 and 5 in the elementary school and the Grade 8 students in the junior school.

Before describing the assessment and classification procedures, it should be re-emphasized that we encouraged the teachers to consider different ways in which learning style could be used. For example, in the open elementary school, students could spend some time in learning style groups and some time in different groups.

Implementation of matching model[2]

CL assessment and provisional grouping.

The PCT was administered last Spring to those students who were to be classified in the two schools. Because the PCT requires a written response, it was found necessary to administer it orally to approximately 20 percent of the students in Grade 4 and Grade 5. In these cases, the student was asked what he thought of a topic, his response tape-recorded, transcribed,and treated as a written response. PCT was scored as described earlier, and these CL scores used to form learning style groups.

Figure 8 describes how the students in each school were finally placed into groups according to the specific requests of the team. It is

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[2] This implementation was similar in many ways to a project described earlier (Hunt, 1964), but here the emphasis is more directly on the process of implementation

Figure 8

Homogeneous classroom grouping by Conceptual Level in two schools

Elementary school

163 Grade 5-6 students tested to be classified into 5 CL groups

Classroom group:	A	B	C	D	E
Number:	29	30	29	37	38
Mean CL score:	.91	1.05	1.18	1.39	1.99
Teacher:	1	2	3	4	5
Characteristics:	Need structure			Need less structure	

Junior high school

156 Grade 9 students tested to be classified into 4 CL groups

Classroom group:	A	B	C	D
Number:	36	40	40	40
Mean CL score:	.95	1.16	1.37	1.95
Characteristics:	Need structure			Need less structure

All four teachers (English, Mathematics, Science, Social Science) taught all four groups.

essential to note that the classification in Figure 8 was conducted entirely according to the specific requirements; e.g., in the elementary school, 165 students were to be placed into five groups. As we will note, the size of the groups could vary slightly, but it was impossible to maintain the "pure" groups in Figure 5. Another way of making this same point is to say that Classroom C in the elementary school is not necessarily the same as Stage C in Figure 1.

Final groupings

The final groupings in Figure 8 were formed to maximize CL variation, but these groups were influenced both by the total CL variation in the group and the constraints of grouping. In describing the meaning of classroom groups from A to E or A to D to the teachers, we told them that they varied in their decreasing need for structure although the variation between some classroom groups was greater than others. However, it was assumed that the matching principle would generally apply.

The final lists of classroom groups were agreed on through discussions with the teaching teams. We presented provisional groupings, and teachers were asked to react to them with suggestions for changes if they wished. (Also, of course, before the final groups were set last Fall, it was necessary to administer and score PCT's to newly-enrolled students).

Elementary school groups. Before discussing the provisional list with the team, we asked them if they had decided which teacher would work

with each of the five groups. Because we have worked with preferred teaching style as well as learning style (Hunt, 1971, Chapters 4 and 5) some people are surprised that we did not assign teachers to learning style groups. However, such a procedure would not only be out of keeping with our belief in the importance of teacher-determined responsibility, but also it might lead to a disastrous allocation of resources in which all five teachers might be found to be best suited with students who need structure. Given the complications of five teachers' deciding which one will take which different job when each of the five must occupy one of the five specific tasks, we were most impressed when the teachers told us that they had decided on their assignments. The teachers mentioned that they had discussed assignments to groups at lunch one day, and it just seemed to work out!

Because the structure needs of the A group required more teacher time, they decided to place fewer students in the A group and more students in the E group. Once the groups were set, we pointed out that if the groups were described according to the stages in Figure 1 that the A group would be mostly immature students, the B and C groups mostly dependent students, while most of the E group would be fairly independent.

Junior high school groups. Since each of the four teachers worked in a room which could accommodate a maximum of 40 students, it was impossible to vary the size of the groups except to keep the A group as small as possible as seen in Figure 7. However, the junior high team modified the lists in a different way. Over two-thirds of the entire group of 156 students were boys and a disproportionate number of them

were in the A group with the result that the provisional A group list contained only four girls. The team decided, therefore, to make the A group an all-boys' group. In relating classroom group to stage group, we pointed out that the A group would contain some immature boys and some dependent boys, the B group mainly dependent students, while the D group were mainly independent students.

Grouping in action: classes begin

In addition to the usual chaos during the first week of school, the two teacher teams immediately faced several questions: What will we tell the students? What will we tell the parents? Can the students change groups? We dealt with these problems as soon as possible by meeting with the students (in the junior high school) and with the parents in both schools to describe the program. The description in Figure 9 summarizes what we said, and this was handed out to each parent. In addition, we emphasized that this work was not an experiment, but simply a procedure requested by the teachers to help them work more effectively with their students. As far as students' changing to another group, we suggested that they give the plan a chance for two months and then, if they still felt that they were in the wrong group, their request would be considered.

The most difficult point to communicate was that the grouping was not based on ability. The students began to believe that it was not ability grouping when, for example, the junior high school A group scored highest on a math test (their response to this was to advise their teacher: "You'd

Figure 9

Learning styles and teaching methods

Students differ in how they learn, or in their learning styles. For example, some learn better by listening to the teacher, some by discussions, and others by working on their own. To say that students differ in their learning styles does not mean that a student needs only one approach (exclusively,) but that, generally speaking, he has one way of learning which for him is better than others.

Similarly, teachers use a variety of approaches, or teaching methods. For example, they may lecture, they may discuss, or they may let the student discover for himself. That is not to say that lecture, discussion, and independent study are the only methods, but they illustrate the variety in ways of teaching. No teacher uses one method exclusively, but he tries to use the method most likely to work with a specific class.

Grouping students by learning style enables the teacher to use that teaching method most likely to work for the majority of students in that class. To say that the teacher will try to match the teaching methods to the class learning style does not mean that only one approach is used. For example, a teacher working with a class whose predominant learning style is for independent learning will not always assign them to work on their own. The teacher will use a variety of approaches with each class, and will ask students in each class to give their opinions and ideas about teaching methods throughout the year. Therefore, the learning style of the class is only to give the teacher some general idea about what teaching method is likely to work best.

Regardless of the class learning style, all classes will learn the same material. It is the way they learn which will differ, not what or how much they learn. Grouping by learning style is simply a procedure to make it more likely that the teacher can meet the needs of the students.

better give those other groups more structure!"). However, we are not altogether satisfied that this difficulty has been overcome, and we plan to evaluate this aspect before continuing grouping procedures.

After these orientation sessions, our role with the teachers has been as informal consultants. We meet with each team usually on a weekly basis to discuss how their work is going and to try to answer their questions. Our work with the teachers and a more general characterization of the year-long program will be described later. For now some of the teacher reactions are summarized in Figure 10 and Figure 11. If the CL matching model is to educationally effective, then variation in structure must be translatable into specific procedures. Models of teaching (Joyce and Weil, 1972, p. 305) just described by Bruce Joyce and his colleagues provide a possible basis for planning such differentially appropriate educational environments. We plan to continue to specify differential teaching methods which we develop and which the teachers develop in the future.

If you consider for a moment the difficulty in planning just one unit, say in Social Science, and then imagine the increased problems of developing two or four instructional variations within which to present this unit, you can begin to appreciate what lies ahead. You may also appreciate why we think that the teaching teams we worked with, who were able to begin to do some of this very complex, demanding developmental work, are indeed very special teachers.

Figure 10

Initial characteristics of classroom groups

Group	Characteristics
Classroom A (Very low CL)	"Short attention span". "Like to be active; there is constant movement". "A lot of physical and verbal fights". "Do not know how to function in group situations or discussion". "Incapable of thinking through a problem; will guess and let it go at that". "Try the rules often". "Work only because the teacher says and look to peers for approval".
Classroom B (Low CL)	"Oriented to the role of a 'good student', one who got the right answers, had neat work and good work habits". "Seek teacher approval". "Want to work alone at their own desks". "Incapable of adjusting to a different teacher". "Upset by visitors or alterations of the schedule". "Do not express personal options". "Are confused by choices". "Want to be told and have the teacher constantly present".
Classroom D/E (High CL)	"Like to discuss and argue". "Everybody wants to talk at once and nobody listens". "Will question and volunteer additional information". "Want to solve things themselves". "Go off on side-tracks". "Don't require teacher rewards". "Are imaginative". "Are not afraid of making mistakes". "Are enthusiastic and eager to go off on things on their own". "See alternatives". "Are adverse to detail and can not tolerate going step-by-step". "Can stay at one thing for a long time".

Figure 11

Methods and procedures which teachers found to be most appropriate for different groups

Group	Methods and procedures
A	"Specific step-by-step instructions". "Make goals and deadlines short and definite". "Give immediate feedback on each step". "Praise often". "Use pictures and things they can see and touch". "Assign definite seats". "Get them to work immediately and change pace often". "Because of inability to discuss, do more seat work".
B	"Have them initially in rows and gradually get them working in pairs, then in small groups". "Use creative drama to encourage spontaneity, self-awareness and cooperation". "Provide non-threatening situations where they have to risk an opinion". "Provide a lot of praise and success oriented situations".
D/E	"Don't require definite seating plan". "Give them many topics from which to choose". "Set weekly requirements and students made up their own timetable". "Encourage them to use each other as resources". "Have to be trained to listen to instructions as they tend to go off on their own".

Criteria for evaluating ideas in terms of implementation

We now return to the central issue of the paper: what are the characteristics of psychological ideas which are implemented into educational practice? We emphasize characteristics of the idea in relation to the teacher or person who will be implementing. This is not to deny the importance of other levels such as the school, the school district, the community, and the neighborhood as determinants of successful implementations (cf. Sarason, 1971). However, we do not find that benefits result from categorical questions such as "Which is more important, innovative climate of the school or the way a teacher thinks?" Therefore, we emphasize how the idea is perceived by a specific teacher or group of teachers and/or their principal.

Based primarily on work in industry, agriculture, and medicine, Rogers (1962) suggested five characteristics of successful innovations:

> "1. Relative advantage is the degree to which an innovation is superior to ideas it supersedes. (p. 124).
>
> 2. Compatibility is the degree to which is consistent with existing values. (p. 127).
>
> 3. Complexity is the degree to which an innovation is relatively difficult to understand and use. (p. 130).
>
> 4. Divisibility is the degree to which an innovation may be tried on a limited basis. (p. 131).

5. Communicability is the degree to which the results of an innovation may be diffused to others. (p. 132)."

If Rogers' characteristics were applied to the present question, then presumably a psychological idea would be more likely to be successfully implemented into educational practice if it were relatively advantageous, compatible with existing values, not too complex, easily divisible for trial purposes, and easily communicable. The characteristics are valuable, but we propose a slightly different list of criteria primarily on the basis of our experience just described in implementation efforts. We consider each criterion generally, and as it is illustrated in the implementation work described earlier.

1. Objective validity. The validity of the psychological idea is obviously important, but it may not be the prime consideration in successful implementation. One reason why teachers/educational decision makers may disagree with psychologists is not so much that they underplay validity, but rather that they do not concur on the criterion for validity. For example, the criterion of statistical significance which many psychologists accept as the only criterion is a major cause of misunderstanding. Significance means to the psychologist a particular and arbitrary procedure to decide on whether the results were produced by chance or not. It does not give any indication of what the layman usually means by significance. Statistical significance may be related to practical significance, but this is not necessarily the case. In evaluating a psychological idea for its implementability,

it is as important that the psychologist understand what is meant by practical significance as it is for the educator to understand generally what is meant by statistical significance. It is not, however, that teachers and educational decision makers are uninterested in validity as we noted in the above example. In many cases, it seems likely that they assume that the psychologist would not attempt to implement an idea which had not been proven valid. In any case, the psychologist needs to understand how the educator views evidence and what criteria for validity are most important in communicating with him about objective validity.

2. Potential relevance. One way of considering the potential relevance of a psychological idea is to use the Lewinian formula , B = f (P,E), or Behavior is a function of the Person and the Environment For the teacher who is working with students (P) to produce certain objectives (B) through different ways of teaching (E), the relevance of the idea may be the degree to which the idea comes close to the behavior, person, and environment which are being used in the classroom (Hunt and Sullivan, in press). Thus, an individual difference characteristic of a student is more likely to be seen as relevant if it is linked to what teachers do. There is, of course, a danger to psychologists if they use only a relevance criterion in evaluating their ideas because may be value in developing ideas which are not immediately relevant. However, on the other hand, some general relevance criterion may serve at least to limit the proliferation of trivial ideas as well as increase the contribution of psychological theory to

educational practice. In the present example, the matching model was seen as relevant because, as Figure 5 indicated, it is linked to what teachers do.

3. Comprehensibility and intuitive reasonableness. Although an idea may have been complex as it developed, it must eventually be stated in terms which are comprehensible and make sense to the person responsible for its implementation. As indicated in an earlier quotation, most teachers have some "implicit theory of matching", even though it may not be very articulate, and the likelihood of a teacher's implementing a differential idea will be determined by its congruence with the teacher's present idea i.e., its intuitive reasonableness. As Rogers (1962) puts it in discussing the adoption of innovations:

> "Old ideas are the main tools with which new ideas can be assesed. One cannot deal with an innovation except on the basis of the familiar and the old-fashioned. The rate of adoption of a new idea is affected by the old idea that it supersedes. Obviously, however, if a new idea were completely congruent with existing practice, there would be no innovation." (p. 127.)

As the last sentence suggests a new idea may be too compatible if it is perceived as identical to the old idea. As discussed elsewhere (Hunt, 1971, p. 74), there is usually an optimal distance between the new idea and old idea.

In the present implementation example, the comprehensibility of the matching idea is illustrated in Figure 7. The idea is seen as very congruent with teachers' experience, and therefore, these teachers saw the model as helping them understand and carry out what they already believed in.

4. Practicality. Educators are understandably concerned with the practical utility of an idea. Can I use it? Will it fit into existing structure and constraints? We made the point earlier that to state a differential idea, e.g., the higher the student CL, the less structure required, does not tell us anything about how to implement this matching principle. It might be implemented within classes, between classes, or between schools. Despite efforts to distinguish matching ideas from their implementation, educational decision makers find it very difficult to grasp the idea of matching without immediately relating it to practice such as homogeneous grouping or individualized instruction.

Educators must initially judge an idea in terms of its practicality because they cannot afford to do otherwise. However, it is our impression from the present example that the teachers have come to understand the idea of matching as distinct from its practical application in homogeneous grouping. For example, one of the elementary teachers said that he liked the idea of learning style because it helped him work with students even though he was not certain that homogeneous classroom grouping by learning style was the best procedure.

Although these criteria appear promising for evaluating ideas in terms of implementation, we do not propose them as the final set of characteristics. However, we note the work of the philosopher, Polanyi in his book, Personal knowledge (1964) which sets forth a philosophy of science much less restrictive than that of logical positivism and operationalism which insisted on objective evidence as the only criterion of evidence. Polanyi suggested three criteria for the scientific acceptance of an assertion: (1) certainty (accuracy), (2) systematic relevance, and (3) intrinsic interest (pp. 135-136). We conclude, therefore, by observing that, insofar as Polanyi's ideas are accepted, there appears to be a convergence of criteria for the practical value of an idea and those used to judge its scientific value.

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